TEACHING PHILOSOPHY

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My varied experiences include teaching undergraduate and graduate students, continuing education and traditional students, and students of different abilities in small classes and large lecture halls. I have taught standard courses like precalculus, calculus, and statistics, general education courses, as well as courses in game theory, linear algebra, operations research, combinatorics, graph theory, and dynamical systems. The same philosophy forms the backbone of all of the courses I have taught. Namely, my goal is for the students to develop critical and independent thinking, to improve their ability to communicate their ideas, and to apply their knowledge.

To emphasize the improvement possible by concentrating on a student's ability to communicate, I have included a submission of homework from a Graph Theory student, as well as an earlier submission of her work. In a mere month, she dramatically improved her ability to communicate. By having students re-write incorrect or poorly written solutions, students learn how to write more concisely and effectively. Although it was time consuming for the students to re-submit their homework and it was time consuming for me to re-grade the homework, the students and I both believed that this was instrumental in the students improving their ability to communicate effectively.

Employing an interactive lecture style, I encourage students to ask questions while asking questions of the students as well. By developing a lively dialogue, I address the students' concerns and problems and adjust the examples to reflect their interests and backgrounds. Often I explain a concept by examining an analogous real-life situation, re-enforcing abstract ideas with concrete, relevant examples. This approach motivates the material in a natural manner while prompting the students to anticipate new directions and to acquire intuition. In the past, I have been able to stress the importance of communicating ideas by incorporating group work in and out of the classroom and assigning projects that include oral presentations. For example, in Calculus II, I have used group in-class assignments to examine Newton's Law of Cooling/Heating; this included having students measure the temperature of a can of soda and predict its temperature at a later point in time. For Calculus III, I had developed an activity where students learn about finding saddle points on compact sets. This work became the article (in Section B: Pedagogy) that I wrote with J. Dorrington of Colorado College and appeared in PRIMUS (Primary Resources in Mathematics Undergraduate Studies) in 2000.

To remain a good teacher one must assimilate new ideas and techniques. The student body is dynamic and the preparation for and teaching of courses should reflect social and cultural changes. I expend great effort to make my courses understandable, utilizing articles from academic journals and the popular press, such as Scientific American, The New York Times, and The Economist. These articles show applications of mathematics in modern thought and stress that mathematics is an on-going endeavor. I have integrated the use of technology in the classroom, using computers and graphing calculators to help

students develop intuition. Advances in technology allow more practical and complex problems to be examined, which previously would have been too computationally difficult to assign. However, it is imperative not merely to teach the use of a specific software package, but to develop the students' grasp of a subject area and their ability to recognize applications of theory. Technology has also created new ways to support and communicate with students. Although face-to-face contact in office hours is still ideal, e-mail has created a new type of communication with students that can be just as productive. Additionally, web sites like Blackboard provide a virtual classroom, or at least a virtual notebook, where students can find all pertinent information about their classes. Although I have only just begun integrating Blackboard into my classes, the initial response from students has been positive.

I think it is important to introduce research to students at all levels. Although my interests in game theory and voting theory lend themselves to this goal, I have also been successful in taking articles in the press and ideas from popular mathematics to interest students about research in mathematics. I applied for and received a Student Faculty Research Grant for a student to examine the likelihood of a false positive occurring in a cryptographic system. The student worked over a summer and enrolled for an independent study course to examine mathematics motivated by an article in The Economist. Our results appeared in The Pi Mu Epsilon Journal. With two undergraduate students, I applied concepts from number theory and abstract algebra to examine the mathematical underpinnings of a puzzle bought at a toy store. Once again, this work was published in The Pi Mu Epsilon Journal. I have also invited graduate students from my classes to work on projects. One of these projects was pedagogical in nature and resulted in a submission to Mathematics Teacher. I am currently working with a student from my graduate course in Combinatorial Mathematics. She and I are writing a piece for Math Horizons to pose new problems in combinatorics and to solve certain low dimensional cases. Not only did all of these students learn mathematics that would not have been taught in a course, but they also learned about themselves by collaborating on a research project.

It is important not only to introduce student to research, but also to offer the students experiences that will help them mature as students and people. Not all successful encounters with research lead to publications. After a student I recommended for a Research Experience for Undergraduates (REU) at Rutgers University finished the program, I agreed to offer her an independent study course in Combinatorial Game Theory, a topic she learned a bit about while in Amsterdam as part of the REU. This student discovered that she did not enjoy research, but she preferred less open-ended problems. She felt the experiences were valuable in learning her likes and dislikes. Another student had the opposite reaction. After working with me on a project in evolutionary game theory, a graduate student decided to apply to the doctoral program in mathematics at the University of Arizona. In summer 2002, this student passed his qualifying exams. For him, exposure to the process of doing research enhanced his graduate training and helped him decide to enroll in a doctoral program.

I am enthusiastic about mathematics and teaching. I hope that my enthusiasm is contagious and that students will become excited about mathematics and its possibilities. I provide opportunities for students to catch this enthusiasm while emphasizing their ability to think critically and independently and their ability to express themselves clearly and coherently. Even if the students never think about mathematics again, the foundation of the courses I teach will benefit my students. I look forward to continuing to stimulate students to think for themselves and to introduce students to new mathematics.